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ABSTRACT

Believing that effective supervision depends upon a well-informed, competent leader, the National Association of Science Supervisors (NSSA) conducted a regional leadership conference for science chairpersons and supervisors (August 10-15, 1980) which focused on (1) increasing leadership skills in selecting supervisory techniques and strategies, and (2) examining trends in science curriculum. Conference topics summarized in this document include: (1) science is a basic; (2) self-assessment guidelines for secondary science; (3) trends in science curriculum; (4) safety and legal liability; (5) chemical safety; (6) interpersonal relations and effective meetings; (7) management skills for science educators; (8) development of reasoning; (9) handling stress and burnout; (10) what research says to the science teacher; (11) new approaches to supervision; (12) objective data gathering in the classroom; (13) federal grants in pre-college science education; and (14) future trends. Names and addresses of presenters are provided for those desiring additional information on a given topic. (Author/SK)

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NATIONAL SCIENCE SUPERVISORS ASSOCIATION

A DIVISION AFFILIATE OF THE NATIONAL SCIENCE TEACHERS ASSOCIATION

... to provide national leadership in science education

The National Science Supervisors Association (NSSA) has been committed to providing national leadership in science education. Believing that effective supervision depends upon a well-informed, competent leader, during the week of August 10-15, 1980, NSSA conducted a regional leadership conference for science chairpersons and supervisors. Over seventy science educators met at the Pocono Environmental Education Center, Dingman's Ferry, PA to participate in a leadership training program which focused on (1) increasing leadership skills in selecting supervisory techniques and strategies, and (2) examining trends in science curriculum. Financial support was received from a grant awarded to NSSA by the National Science Foundation under the Information Dissemination for Science Education Program. Four Regional Teams, composed of two members each, from Michigan, Colorado, Georgia, and Washington, attended in addition to the 47 participants and 18 project staff members. The Regional Teams, in turn, will conduct similar leadership conferences in their respective areas during the spring and fall of 1981.

These "Proceedings" represent a collection of summaries for most of the conference sessions. They in no way reflect the entire content of each session; however, they do present a concise statement both individually and collectively. For more information regarding any particular topic, you are cordially invited to contact the presenter.

NSSA extends its sincere thanks to all who made the leadership conference a success.

Robert De Blasi
Project Director

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SCIENCE IS A BASIC

Lonnie Love, Science Consultant, Georgia Department of Education, Department of Education Annex, Atlanta, GA 30334

Topics:

Is science basic to schooling,

historically? (A "natural science" since mid 1800's)

legally? (Most states have graduation requirements.)

philosophically?

practicality? (Present problems of energy and environment)

Is science basic to learning?

process/content model

skills/concept continua

exposition/inquiry model

major theorists

Is science basic for coping,

with school? interdisciplinary reinforcement

with home? practical application of knowledge

with society? decision making

with person? improved concept

Is science basic for survival?

technology demise

"Dark Ages" spectre

Science is not a basic, it is the basic!

What can supervisors do to assure the place of science?

1. Enhance and nurture good teaching.

SELF-ASSESSMENT GUIDELINES FOR SECONDARY SCIENCE

Essie C. Beck, NSSA President, Personnel Supervisor, Jefferson Parish School Board, 519 Huey P. Long Avenue, Gretna, LA 70053, and LaMoine L. Motz, Director, NSTA Division of Supervision, Director of Science, Health, and Outdoor Education, Oakland County Schools, 2100 Pontiac Lake Road, Pontiac, MI 48054

The session, "Self-Assessment Guidelines for Secondary Science", was geared to explain the process for the development and utilization of the NSTA evaluation instrument on "Guidelines for Self-Assessment of Secondary School Science Programs".

The presentation was designed to illustrate how the various modules of the instrument could be used effectively in evaluating the various components of secondary science programs and curricula.

The presenters endeavored to show the participants the advantages of the various instruments and what they provide for the teacher and total school program.

The following was stressed in the presentation for the use of the instruments:

1. Provide structure, as well as, direction for evaluation.
2. Offer non-threatening measures as they allow for identifying strengths and weaknesses of science programs, teachers, and facilities.
3. Encourage a self-examination as to what is desired in our schools and what is being accomplished.
4. Designed so that there are no norms to be compared.
5. Allow for interaction between teacher/teacher, teacher/administrator, teacher/student, teacher/parent.

6. Results of the assessment are known immediately because of using a collective matrix as a means of summarizing the results.
7. If facilities are available, individual scoring may be programmed for computer analysis for comparison results.

The conference participants worked on a sampling of the instrument by completing the matrix. Results of the sampling were shared by the participants. An interaction between the presenters and the participants followed the presentation. Samples of various computer printouts, utilizing the chi-square analysis program, were presented. Also, an outline of a district level use of the "guidelines" was presented. For additional information on how to use the computer to analyze the NSTA Self-Assessment data, participants may contact LaMoine Motz, Oakland Schools, Pontiac, MI. The Self-Assessment Guidelines are available through the National Science Teachers Association, Washington, D.C.

NOTE: The following page is a sampling from the NSTA self-assessment of science programs module, "Our School's Science Curriculum".

I. Our School's Science Curriculum

For purposes of this document and its goal of encouraging self-assessment, the school science curriculum is considered to be comprised of everything that students study and everything that they do when they "take science" as part of their educational program. A course in chemistry, the study of various minicourses, participation in a science club or a student science contest, a science project, a field trip to a sewage disposal plant, or a medical research center, or a plastics manufacturing plant — all of these kinds of activities, and others as well, help make up the total science curriculum.

In this section, you are encouraged to review, ponder, and evaluate the science curriculum in your school for **your** children and students — and then (1) decide what it is that you want or expect the science program to accomplish and (2) assess how well you think your science goals and desired results are being achieved. You should, of course, try to think in terms of the overall, the large picture, and develop judgments not swayed or biased unduly by infrequent exceptions.

It is strongly recommended that the ratings for this section, except Part B, be developed through consensus of a committee representing not only the school science faculty but also including broad representation of the science students, parents of students, scientists and engineers from your community, employers of students upon leaving school, and/or other groups as appropriate or desired in **your** community. Section B should be done by a representative student committee and a science department committee. A separate matrix should be completed by both groups.

A twofold assessment is called for — the first in terms of the DESIRABILITY of the various aspects of preparation, professional activities, and attitudes for **your teaching situation** and **your school**. The second is an assessment of the degree of ACHIEVEMENT of the item. The rating scales to be used are as follows:

DESIRABILITY for Our School

4 — **very desirable**; of utmost value
3 — **desirable**; of significant value
2 — **moderately** desirable; of medium value
1 — **unimportant**; of insignificant value in our school science program
—1 — **undesirable**; of negative value in our school science program

ACHIEVEMENT in Our School

4 — **excellent**; outstanding, extremely high level
3 — **very good**; above average
2 — **moderate** but significant; about average
1 — **low** (small) achievement or practice; below average
—1 — avoided or counteracted in our school

At the right of each item is a small matrix in which the rating is recorded. The vertical axis represents DESIRABILITY. Circle the rating that you wish to give to desirability. The horizontal axis represents ACHIEVEMENT. Circle the rating that you wish to give to achievement. Then, for the score on this item, place a check mark in the box where these ratings intersect. Thus, an item that was deemed highly desirable but only moderately achieved would be recorded as follows:

DESIRABILITY

4					
3			✓		
2					
1					
−1					
	−1	1	2	3	4

ACHIEVEMENT

An item considered undesirable, but found to be present to a high degree would be recorded as follows:

DESIRABILITY

4					
3					
2					
1					
−1				✓	
	−1	1	2	3	4

ACHIEVEMENT

A. Why Science in Our School?

The first, most obvious question to ask about the school science program is why is it there: what do we want the study of science to contribute to the education of our children; what would be lost if science disappeared from the total educational program? Consider and discuss all of the following items, plus others you may wish to add, and then evaluate each as per instructions.

1. Science is required by state law

DESIRABILITY					
4					
3					
2					
1					
−1					
	−1	1	2	3	4

ACHIEVEMENT

Comments ______________________

2. Science is a tradition in our school

DESIRABILITY					
4					
3					
2					
1					
−1					
	−1	1	2	3	4

ACHIEVEMENT

Comments ______________________

3. The major purpose of science study is to lay the foundation for students to take more science.

DESIRABILITY					
4					
3					
2					
1					
−1					
	−1	1	2	3	4

ACHIEVEMENT

Comments ______________________

4. Science helps students prepare for entering college after leaving high school

DESIRABILITY					
4					
3					
2					
1					
−1					
	−1	1	2	3	4

ACHIEVEMENT

Comments ______________________

5. Science leads to understanding of the interrelationships and interdependence among man, plants, animals, and the air, water, soil, and other materials of planet Earth.

DESIRABILITY					
4					
3					
2					
1					
−1					
	−1	1	2	3	4

ACHIEVEMENT

Comments ______________________

6. Science reveals a variety of career opportunities, regardless of sex or ethnic background, in science and other science-related occupations

DESIRABILITY					
4					
3					
2					
1					
−1					
	−1	1	2	3	4

ACHIEVEMENT

Comments ______________________

7. Science helps students use knowledge of science in decision-making relative to problems of man and society; e.g., food supply; human sexuality, reproduction, and population; environmental quandaries; energy supply and demand; health facilities and services; city and regional planning; other.

DESIRABILITY					
4					
3					
2					
1					
−1					
	−1	1	2	3	4

ACHIEVEMENT

Comments ______________________

TRENDS IN SCIENCE CURRICULUM

Donald Maxwell, Assistant Director of Science, Oakland School District, 2100 Pontiac Lake Road, Pontiac, MI 48054

Before we look at what some of the trends are in science curriculum today, it may be worthwhile to look at some factors which have a great deal of influence on education overall. I've chosen the following four to examine briefly.

1. Students, 2. Teachers, 3. Society, 4. Technology

STUDENTS

There has been a continued decline in student enrollment in science at the secondary and college levels. Indications are that science is not a popular field for students any more. Attitude and discipline problems continue to be a hindrance to instruction in many communities.

Student scores nationally in science have continued to drop in spite of the development and use of the NSF science programs of the 60's and the efforts at reaching the uninvolved during the 70's.

One bright area for the future of secondary science education may be the positive change at the college level where students' attitudes toward education in general, have improved. If this trend continues through the 80's, it could provide science education with a core of well trained and motivated teachers.

TEACHERS

Teachers, as a group, are getting older and are less likely to want to change. This trend will probably continue throughout most of the 80's.

Elementary teachers continue to enter the teaching field with a poor background in science and with a fear of teaching it.

Secondary teachers, with the drop in funding by NSF during the late 60's and early 70's, have had few opportunities to keep abreast of their content areas. From all current indications, there appears to be some promise in providing more opportunities for science teachers in the future, but not at its previous levels.

Teacher attendance at state and national science education conferences has declined and continues to do so.

SOCIETY

The current economic problems compiled with declining enrollment and lowering test scores, have caused many citizens to question the effectiveness of education overall. In addition, the problems related to the environment and energy have had a negative impact upon science and science education.

As educational costs continue to rise there has been pressure to increase class size, reduce the amount of money for equipment and supplies in science education, and to eliminate support personnel (supervisors, consultants, department chairpersons) at all levels.

Special interest groups have and will continue to bring pressure upon the schools in order to gain control over what is being taught.

Other nations are moving ahead of the United States in science and technology creating a rising concern at national levels. This may provide science education with a renewed vigor during the 80's.

TECHNOLOGY

With the advances that have been made in the past and the predicted future improvements, it appears that there will be an increased use of electronic devices in science education. Microcomputers and calculators are just two examples where improvements have been accompanied by reduction in cost, making their use in education at least economically sound.

While the above factors are not the only influences on science curriculum, they are important factors which have had an effect on what the science curriculum is today and what direction it will take in the future. Here are a few of the current trends in science curriculum.

ELEMENTARY CURRICULUM :

Knowledge gained through student investigation and experience → reading and/or being told about science.

Curriculum being developed based upon learning theory and research → curriculum being developed based on what will sell (nationally) or what we can put together in a few weeks (local committee).

NSF Programs (less than 10% of the schools used them) → text programs, local programs, or no program.

NSF Programs → Second generation programs which combine the hands-on with text material.

MIDDLE SCHOOL AND JUNIOR HIGH CURRICULUM

Traditional junior high content areas (Life, Physical, and Earth Science) → ? (No real direction is evident and publishers who have attempted to develop programs for this level have had little success.)

HIGH SCHOOL CURRICULUM

NSF Curriculum Project courses → Second and third generation courses providing some of the features and content of the NSF materials with the traditional text programs of the past.

Mini courses (special topics 8-10 weeks duration) → Traditional length Biology, Chemistry, Physics, and Earth Science courses.

Few, if any offerings beyond a basic science course → advanced courses in content areas.

ALL LEVELS

Special schools or classes for special education and handicapped students → mainstreaming (requiring modifications in content and activities).

Science class for general students → science for the gifted and talented.

SAFETY, THE SCIENCE TEACHER, AND LEGAL LIABILITY

Joseph Krajkovich, Science Supervisor, Edison Township Public Schools, Edison, NJ 08817

The science teacher can incur legal liability through negligence. There are three basic duties that relate to the concept of negligence in a science classroom. These are the duty of instruction, the duty of supervision, and the duty of properly maintaining equipment and materials which are used.

Negligence under the law may be defined as conduct which falls below a standard of care established by law to protect others against an unreasonable risk of harm. This is the concept of tort law. If the standard of care is not defined in law, then the actions or inactions of an individual are judged against what another reasonably prudent individual would have done under the same circumstances. An important aspect of reasonable behavior is anticipation. The reasonable person must be able to anticipate the common ordinary events and, in some cases, even the extraordinary.

Students in a science laboratory should never be allowed to proceed without first receiving instruction in the basic procedures involved, some suggestions on proper conduct while engaged in the activity, and the identification and methods of avoidance of any risks to be encountered.

Teachers are to:

1. Protect the health, welfare, and safety of their students.
2. Foresee the reasonable consequences of their inactions.
3. Instruct their classes before the students attempt independent projects.
4. Plan activities carefully.
5. Relate any risks in an experiment to their students immediately before undertaking the activity.
6. Create an atmosphere of proper laboratory behavior.
7. Report immediately all hazardous conditions to supervisory personnel.
8. Keep adequate records of all aspects of laboratory operations, especially on instruction in safety.
9. Maintain personal supervision of all students in a laboratory under the teacher's charge.
10. Be aware of all pertinent laws and regulations that relate to laboratory activities in science.

LIABILITY AND THE SCIENCE TEACHER (cont.)

A Self Examination

Thanks to the Connecticut Journal of Science Education.

In each of these cases listed below, a science teacher was being sued for liability. As a member of the jury, would you judge these teachers guilty or not? Assume that the relevant facts have been given. Write your answer in front of each case, G=Guilty; NG=Not Guilty. Answers are at the end.

____ 1. A biology teacher requested a student to bring a glass beaker from the back of the room to the demonstration table. The student fell and received serious wounds from the broken beaker.

____ 2. A student in a chem lab injured himself while inserting glass tubing into a rubber stopper. The teacher had previously demonstrated and properly instructed all students concerning the method and dangers involved. The student attempted to force the glass tubing into the stopper and was injured when the tubing snapped and went through the palm of his hand.

____ 3. During a physics lab a teacher stepped out of the room for a few minutes to obtain a reference book from the library. In his absence a serious accident occurred.

____ 4. On a field trip a science teacher led his students across a precarious looking footbridge. The bridge collapsed and caused serious injury to several students.

____ 5. A teacher asked two students to clean a chemical stockroom, warning them of an unlabeled jar of acid on a high shelf. A scuffle caused the acid to fall and the students were seriously burned.

____ 6. A student was sent to the drugstore in his own car to purchase some hydrogen peroxide. On the return trip he hit another car when he ran a red light. The student had no insurance and he sued the teacher.

____ 7. A student was asked to water the plants in the greenhouse lab adjoining the botany classroom. The student carried a glass bottle full of water, tried to climb a chair and was seriously injured when the chair collapsed. The chair was in good repair.

____ 8. Three students in a chemistry class making up a lab exercise on the preparation and properties of oxygen. The teacher told them to gather the materials necessary to the experiment and to follow the safety instructions in the writeup. Contrary to the written directions, the students mixed potassium chlorate with red phosphorus and ferric oxide, and heated them with a Bunsen burner. An explosion resulted; several students were injured.

Answers

1. NG	5. G
2. NG	6. G
3. G	7. NG
4. G	8. G

CHEMICAL SAFETY

George Gross, Teacher, Union Township Public Schools, Union, NJ 07083

Titles of various local newspapers indicate the importance of chemical safety in the public schools. Some of these titles are, "Benzene Ban", "School Chief Cautious on Science Labs", and "More Lethal Acid Carted Off".

Many states have passed regulations regarding safety. Conference participants are requested to check for local and state regulations. OSHA guidelines may apply in your state while they may not apply in others. The eye protection law in New Jersey is very specific. Check out your own locality for specific laws.

EYE SAFETY

1. Science teachers should wear goggles as a role model.
2. Safety goggles should be worn in all science labs:
   a. Chipping bone in BIOLOGY
   b. Formaldehyde in BIOLOGY
   c. Laser use in PHYSICS
   d. Chemical preparation in CHEMISTRY
3. Most laws specify VENTED, SPLASH-PROOF goggles.
4. OSHA specifies shatter-proof goggles and a minimum thickness.
5. Goggles come in various sizes for elementary (small people) schools as well as young adults.
6. Face shields do not meet minimum OSHA regulations for chemistry laboratories and are not a substitute for goggles.

7. Eye wash bottles should be on each table. (Most eye injuries are the most severe during the first 5 to 10 seconds. If the teacher or student can get to the eye injury within the 5 to 10 second period, 90% of the damage will be eliminated.)
8. Eye wash bottles ahould be kept (a) clean and (b) filled with distilled water or sterilized water.
9. Students may have their own goggles for the year or an ample supply for the year should be on hand. It is preferable to have enough for the students and another set for sterilization.
10. Always buy goggles that have replaceable lens.
11. Methanol may help to sterilize lenses, but most likely will dissolve the plastic. Methanol is also toxic and readily absorbed through the skin and via inhalation.
12. Cleaning: 1/2 cup of Clorox (Bleach) to a pail of water. Though this may deteriorate the plastic and rubber, it will do so at a lower rate than ultra-violet light.

STORAGE AND LABELING

1. Obtain a list of common carcinogens and try to avoid their use.
2. There are now substitutes for asbestos gauze-mesh. Porcelain centers may be substituted; however,

these are more expensive. Another alternative would be to use plain wire mesh. These are relatively inexpensive. Ceramic centers cost 5 times as much as asbestos but are not carcinogenic.

3. Sometimes we tend to think that all of this confusion over carcinogenic substances relates ONLY to industry. When we multiply use of suspected carcinogens times 25 students and consider pouring all of this down the drain of a science laboratory, the problem becomes similar to industry.
4. Substitutes for listed items are:
   a. Ethylene Dichloride
   b. TTE
5. Other alternatives would be to:
   a. Use micro-quantities
   b. Enough for demonstrations only
6. Suggestion: store chemicals into organic and inorganic areas instead of alphabetically.
7. Ether: six month maximum shelf life. Forms explosive peroxides in can. Store in refrigerator (explosion-proof if possible). Put bright iron nail in can and a small amount of distilled water. Try to use other anesthetics.
8. Inventory: As bottle comes in, write date on label. Use old bottles first. If available, use computer

for inventory. If interested in how to write a program for inventory, WRITE: New Jersey Science Teachers Association, INC., c/o George Gross, past-president, Union Township Public Schools, Union, NJ 07083.

9. Always break-down large bottles of chemicals before allowing students to handle it.
10. Recommended pouring small amounts of wastes down the drain (especially where there are sewer treatment stations) and flooding with water especially when the alternative is an extended shelf-life.
11. Try to use the local fire departments for chemical disposal.
12. Might be worthwhile to incur a one-time only expense of calling an industrial disposal company.
13. Suggestion: Identify bottles (a) Health Hazard-BLUE, (b) Flammability-RED, and (c) Reactivity-YELLOW.

CHEMICAL SAFETY NOTES HANDOUT (cont.)

New Jersey Science Teachers Association Inc. Newsletter, Volume 11, Issue No. 10, June 1978

Chemical storage is a safety problem both for industry and education. The problem is that many chemicals are incompatible with each other and the common method of storing chemicals in an alphabetical order sometimes results in incompatible neighbors. A recommended solution is to separate chemicals into inorganic and organic chemicals. Once separated, the chemicals can then be stored in families that are compatible with each other. Below is such a list. Each numbered line represents a shelf with the chemical families that can be stored together in relative safety.

INORGANIC

1. Metals, Hydrides
2. Halides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens
3. Amides, Nitrates (except NH_4NO_3), Nitrites, Azides, HNO_3
4. Hydroxides, Oxides, Silicates, Carbonates, Carbon
5. Sulfides, Selenides, Phosphides, Carbides, Nitrides
6. Chlorates, Perchlorates, Perchloric Acid, Chlorites, Hypochlorites, Peroxides, H_2O_2
7. Arsenates, Cyanides, Cyanates, HCN
8. Borates, Chromates, Manganates, Permanganates
9. Acids (except HNO_3, HCN)
10. Sulfur, Phosphorus, Arsenic, P_2O_5

ORGANIC

1. Acids, Anhydrides, Peracids
2. Alcohols, Glycols, Amines, Amides, Imines, Inides
3. Hydrocarbons, Esters, Aldehydes
4. Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
5. Epoxy Compounds, Isocyanates
6. Peroxides, Hydroperoxides, Azides
7. Sulfides, Polysulfides, Sulfoxides, Nitriles
8. Phenol, Cresols

Volatile ethers, hydrocarbons, etc. should be stored in an explosion proof refrigerator.

This list is not complete, nor is it the only recommended method of storage. But it is a method that can be conveniently used in the average high school laboratory.

INTERPERSONAL RELATIONS AND EFFECTIVE MEETINGS

Dr. Dana M. Aaron, Coordinator of Dormitories, 202 Steele Hall, Syracuse University, Syracuse, NY 13210

Dr. Aaron's session was directed toward improving the participant's leadership skills and ability to conduct effective meetings. Initially, each person was asked to rate his present leadership ability and desired level of leadership. The remaining activities were utilized to bridge each participant's perceived leadership gap.

A brainstorming session produced lists of characteristics of effective meetings and ineffective meetings. It was followed by each participant identifying personally his most troublesome, meeting-related problem. Dr. Aaron categorized the personal meeting-related problems and coordinated small group discussions of potential solutions to the problems utilizing the following analytical questions: GOT A PROBLEM?

1. Clarify the problem.
2. Why is it a problem?
3. What can be done to eliminate the problem?

Each small group subsequently reported its proposed solutions to the identified problems and utilized its ability to analyze leadership styles and adaptability gained as part of an earlier, prerequisite exercise.

The LEAD Instrument ("Leader Effectiveness and Adaptability Description") was completed by each participant and analyzed to determine emphasis on tasks and relationships. Task behavior was defined as "the extent to which a leader organizes and defines"; while relationship behavior was explained as "the extent to which a leader engages in personal relationships". Through analysis of scores on the LEAD Instrument, participant leadership styles were matched to the example:

LEADERSHIP STYLES

RELATIONSHIP BEHAVIOR ↑		
	Quadrant III Low Task High Relationship	Quadrant II High Task High Relationship
	Quadrant IV Low Task Low Relationship	Quadrant I High Task Low Relationship
	TASK BEHAVIOR →	

Discussion of leadership styles underscored the importance of adaptability in employing leadership styles. Effectiveness of leadership behavior was explained as "being a function of a leader's adaptability in employing leadership styles". An explananation of the changes or maturation that can occur in a group was summarized by the Life Cycle Theory. Presented graphically, group maturity was shown to proceed through the attendant leadership style quadrants as follows when groups changed from lower to higher maturity levels:

Quadrant III	Quadrant II
Quadrant IV	Quadrant I

GROUP CYCLE

(as group matures)

MATURITY

High	Moderate	Low

In this example, group maturity was defined as "the capacity to set high, but attainable goals, ... and a willingness to take responsibilities".

Relating leadership styles to group maturity as summarized in the above graphics, Dr. Aaron suggested the following application of leadership styles to the groups' level of maturity:

LIFE CYCLE THEORY

Low Maturity- Use a High Task Style (Quadrant I for success)

Average Maturity- Moderate Structure (Quadrants II and III for success)

High Maturity- Low relationship/low style (Quadrant IV for success)

As a concluding activity, participants were asked once again to rate their present leadership ability (having analyzed their leadership style with the LEAD Instrument) and their desired level of leadership, and to formulate and write a good statement for themselves for the coming year.

Ways To Reduce Resistance To Change

1. Be Prompt. Announce an impending change as quickly as possible. Don't give the rumor mill a chance to grind out stories that aren't true but are hard to deny.
2. Explain the reasons. Tell members why the change is important and how it affects them. Will it help do more work better and faster? Why is it better than the old way? Will it help the organization prosper and the members as well? If you distort the reasons, members will be doubly antagonistic when they learn the truth.
3. Explain what the changes mean to the individual. Try to let each member know how the change will affect his/her particular job. Explain the benefits and pledge protect your people against losses.
4. Ask for advice. Many experts overlook the good firsthand experience they can get from people who do the jobs. Your members can often point out the real pitfalls in a plan that looks perfect on paper.
5. Invite participation. Get your members into the act whenever you can. Here's a good example: In a company that needed new dictating transcribing equipment, secretaries and managers were asked to help pick the best kind. The new equipment went in without a bit of opposition.

Ways To Reduce Resistance To Change

6. Don't change for the sake of change. Some leaders try to prove their own worth by making frequent shake-ups in routines. Members know this and resist every change, even the worthwhile ones.

7. Avoid trivial changes. It might be handier to move a file cabinet, but if it causes a fight, why bother? Save your energy for more important changes.

8. Avoid surprise. Lay the groundwork carefully; discuss the problems caused by the old method and then suggest, "Let's try it this way and see how it works."

9. Be careful of status. Every group has status symbols that are zealously sought and jealously guarded. Don't let a change build one member's status at the expense of another's.

10. Keep out of ruts. A good way to pave the way for progress: Have members alternate duties as much as possible. A planned program of job movement won't let people become firmly entrenched in private little procedures. Two extra benefits: It cuts down boredom and makes your work force more flexible.

11. Avoid chain reactions. Don't unsettle your members by springing a batch of changes, one right after another. Try to space them out or make one big change.

Ways To Reduce Resistance To Change

12. Sweeten one change with another. If you've got to make a change that won't be popular, try adding some benefits to make it more palatable.
13. Don't accuse members of resisting change. It may be true, but most people don't realize it or won't admit it. You'll only force them to try all the harder to prove that a new method won't work.
14. Allow plenty of time. Don't expect any new procedure, idea, equipment, or layout to be an instant success. It takes awhile for people to adjust.

How To Get More Discussion And Ideas From The Members

I. Seven major problems stand in the way of success: (Here they are with some suggested solutions.)

A. Poor Leadership:

1. Become acquainted with individual members, their interests and resources.
2. Know your group, its objectives and its structure.
3. Learn to apply effective group techniques.

B. Poor Participation:

1. Create a friendly atmosphere with all members feeling a part of the group.
2. Acknowledge all contributions however small, and without value judgement from the chairman.
3. Distribute discussion widely among individuals.

C. Lack of Focus:

1. Define the problem clearly.
2. Summarize main relevant points at the first sign of irrelevancy.

D. Lack of Movement:

1. Have an outline of main points to be covered. Summarize and conclude each one, then move on to the next.
2. Delay the critical evaluation of ideas until all ideas have been expressed.

How To Get More Discussion And Ideas From The Members

3. When lag is due to lack of information, call in some experts or set up a committee.
4. Put the entire agenda on the chalkboard; members can then gauge the need for movement.

E. Overdiscussion:

1. Define the problem and summarize points made to prevent repetition.
2. Ask for "new points".
3. Suggest a time limit on discussion-with the group's permission.

F. Personal Dominations:

1. Give him/her a "busy" job at the chalkboard, an errand or make him/her an "observer".
2. Request dominating individuals to let the group hear from some others.
3. Require chair recognition as a means of distributing discussion more widely.

G. Clique Domination:

1. Have a plan for splitting cliques (buzz groups)..
2. Have a plan of mixing up cliques (a color, number, or other matching technique at the door).

II. Summary

No group fails because it wants to fail! It fails because it does not know how to succeed. The critical factor is untrained, insensitive, inflexible leadership.

Characteristics of the Ideal Leader

* To begin with, this leader is, as leaders always have been, discontented with the status quo, but is more committed than his/her predecessors to change as a way of life. He/She is aware that the world is changing rapidly and that his/her organization must change to survive.
* He/She accepts and, indeed constructively exploits the fact that young persons entering his/her organization will possess more knowledge in some areas than he/she.
* He/She refuses to allow rigidity to creep into his/her organization. He/She is comfortable with relatively unstructured situations in which talented people form and reform into different task-oriented teams to solve problems of the moment and to plan against problems of the future.
* He/She needs very little in terms of the trappings of authority or the crutches of procedure to enable him/her to function effectively.
* He/She moves into and out of the assembled teams of talent, leading some, being a member of some. He/She has, therefore, developed both leadership and membership skills.
* He/She enters freely into group discussions to resolve problems and tries to avoid solutions that imply that one person or one group "wins" at the expense of others.
* He/She makes decisions and commits himself/herself to them, but he/she also allows associates to make decisions. He/She is careful neither to smother individual initiative by

Characteristics of the Ideal Leader

group processes nor to deny the interdependence of modern organizations by overemphasizing individual competition.

* He/She shows confidence in associates, is interested in them, relies on them to do their jobs and helps them to grow.
* He/She does not accept poor or sloppy performance but gives feedback on performance, readily to individuals or groups in ways that are supportive, constructive, and conducive to strong motivation.
* He/She focuses on the strengths of people rather than their weaknesses and follows the organizational principles of combining strengths to solve problems, to plan, and to make decisions.
* He/She accepts disagreement and differences among people as assets to the organization. He/She has acquired, or is acquiring, the systematic knowledge that enables him/her to help associates work through defferences whenever possible and find solutions that are best for the enterprise.
* He/She accepts the fact of differences in personalities, expectations, experiences, and other variables; and so does not expect associates to conform to his/her pattern.
* He/She has acquired the skill of being a good and patient listener and an articulate and painstaking communicator, both with individuals and with groups.

Characteristics of the Ideal Leader

* He/She is an upward influencer. He/She stands for value systems that are recognized as good and constructive both with respect to the people in the organization and the aims of the organization itself. He/She has a genuine concern both for the effectiveness and efficiency of the organization and for the people in it, and does not see these concerns as being contradictory.

AN INTRODUCTION TO MANAGEMENT SKILLS FOR SCIENCE EDUCATORS

Bernard Novick, Associate Director-Planning, Woodbridge Township School District, School Street, Woodbridge, NJ 07095

Department heads and supervisors are managers. As such their tasks should include defining and elucidating problems, setting objectives, organizing tasks and resources, supervising, and evaluating results.

The first and perhaps most difficult step in the management process is clearly defining what the problem is. Once that is done, an objective designed to solve the problem is set. Inherent in setting an objective is simultaneously stating the criteria which will make success evident.

The second step in the process is to list the tasks which must be done. After the major tasks are listed, they next are broken down into component tasks in as many hierarchial levels as are suitable. It is important not to define <u>how</u> the task should be accomplished, only <u>what</u> is to be done. Those who are to complete the task should decide the how. They should be allowed to use their own styles and creativity.

The third step is to decide <u>who</u> is to <u>do</u> <u>what</u> and <u>to</u> <u>what</u> <u>standard</u>. A good manager matches personnel to tasks and informs each person of the criteria for success on each task.

The fourth management task is to prepare a chart which defines a time frame for meeting the objective. A Gantt chart

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is a convenient medium. It is in effect a bar graph of tasks (vertical) vs. time (horizontal). Each box spans the time when the task must be performed.

An evaluation scheme should include the kinds of information needed for assessing not only the attainment of the objective, but for determining success in completing critical tasks along the way. The purpose always is to use the data in making decisions about what changes need to be made.

In supervising or controlling the project, one does not control people, one controls events and resources. Tasks may be restructured as dictated by evaluation of outcomes. Since everyone must be working toward the same objective, it is wise to include as many key individuals as possible in the planning at all stages.

DEVELOPMENT OF REASONING

Charles Beehler, Science Supervisor, Rose Tree Media School District, 901 North Providence Road, Media, PA 19063

_____ Material available from:

Lawrence Hall of Science

University of California-Berkeley

Berkeley, CA 94720

_____ Piaget's greatest contribution (according to Beehler): testing for formal and concrete operational thinking based on science concepts and processes.

_____ Formal thinking depends (in part) upon opportunities to think formally with others in many contexts.

_____ Film: "Assessing Formal Thought"

_____ Recommended book: Piaget for Educators, Robert Sund, Charles Merrill Publishing Company, 1976.

_____ Self Regulation

... an active process-involved with physical environment and involved with ideas of others

... forms new reasoning patterns

... involves problem analysis and understanding
tentative solutions
evaluating tentative solutions
awareness of one's own reasoning

_____ Concrete Reasoning Patterns include:

class inclusion, conservation, serial ordering

HANDLING STRESS AND BURNOUT

John Thornton, Uniserve Representative, NJEA, New Jersey Education Association, Rte. 4, Highways 202 & 31, Flemington, NJ 08822

Mr. Thornton stated that many people are getting out of teaching because of the stress they experience. Stress factor solutions are very complex. The speaker listed 5 basic factors that might help the individual. They are:

1. Diet- Look seriously at your diet.
2. Environmental Sensitivity- Stay away from the factors that give you stress; look for positive support.
3. Physical Fitness- Determine some physical factor to take care of yourself.
4. Self Responsibility- Be in control of yourself.
5. Stress Management- Stress is everywhere; either deal with stress or deal with it dysfunctionally.

Looking at Yourself

Look at your life activities and determine the amount of time you spend in teaching, supervising, family, meetings, self, etc. These activities or lack of them are major factors for heart attacks and other forms of death.

The speaker defined "stress" as "a non specific biological response outside the body". He believes the individual is important and that you should make and take time for "self". He further stated that hostility is something you have to deal with; try not to bottle it up inside yourself. It is important that the individual recognizes his level of stress tolerance.

Four techniques of dealing with stress are:

1. Recognize stress before it becomes distress.
2. React to stress; keep it from getting out-of-hand.
3. Avoid a pace of life that produces excessive stress.
4. Cope with stress/distress to reduce it rather than aggravate it. (Several methods were listed to cope with stress; they were: leave scene, vacation, change jobs, end relationship, assertiveness, candid-ness, honesty, empathy, understanding, new skills, and diplomacy.)

It was further recommended that the individual plan his daily schedule in such a way that it reduces opportunity for stress. Don't overload that schedule! The individual must decide how much he is willing to risk in order to reduce the stress factors. A number of stress filters were suggested that may be utilized by the individual. The individual has to determine what he wants in life and how much it is worth to achieve his desires.

WHAT RESEARCH SAYS TO THE SCIENCE TEACHER

Dr. James Shymanski, Professor, Science Education Center, The University of Iowa, Iowa City, Iowa 52242

Dr. Shymanski provided an overview of several areas of research relevant to science education. He directed his remarks to the following areas:

1. Relative monies being devoted to research in science education
2. The framework around which we can analyze science education research
3. The lack of a unifying theory in education
4. National techniques for gathering information about what to research
5. The results of research on learning
6. Learning theory as related to student classroom attitude
7. Research on teaching skills

A series of pertinent points were made relative to the seven categories above. Although the points may be out of the context of Dr. Shymanski's total presentation, each are listed and can stand alone.

____ Research in science education has had little financial support.

____ A large segment of the science education community doesn't perceive research as important.

____ Science teaching is a mixture of science, art and technology.

- National Delphi study results on research areas which are needed, indicate that: (1) analyzing and applying learning theory, (2) conducting needs assessment, (3) effects of teaching strategies on performance, are of most interest.
- Research related to learning in science education indicates that the results seem to be divided between schools of behavioral, developmental and technological thought processes.
- Student interest, self-concept, flexible organization, and teacher interest are the major factors affecting student achievement in the classroom.
- Mixed levels of questions result in highest levels in achievement.

NEW APPROACHES TO SUPERVISION

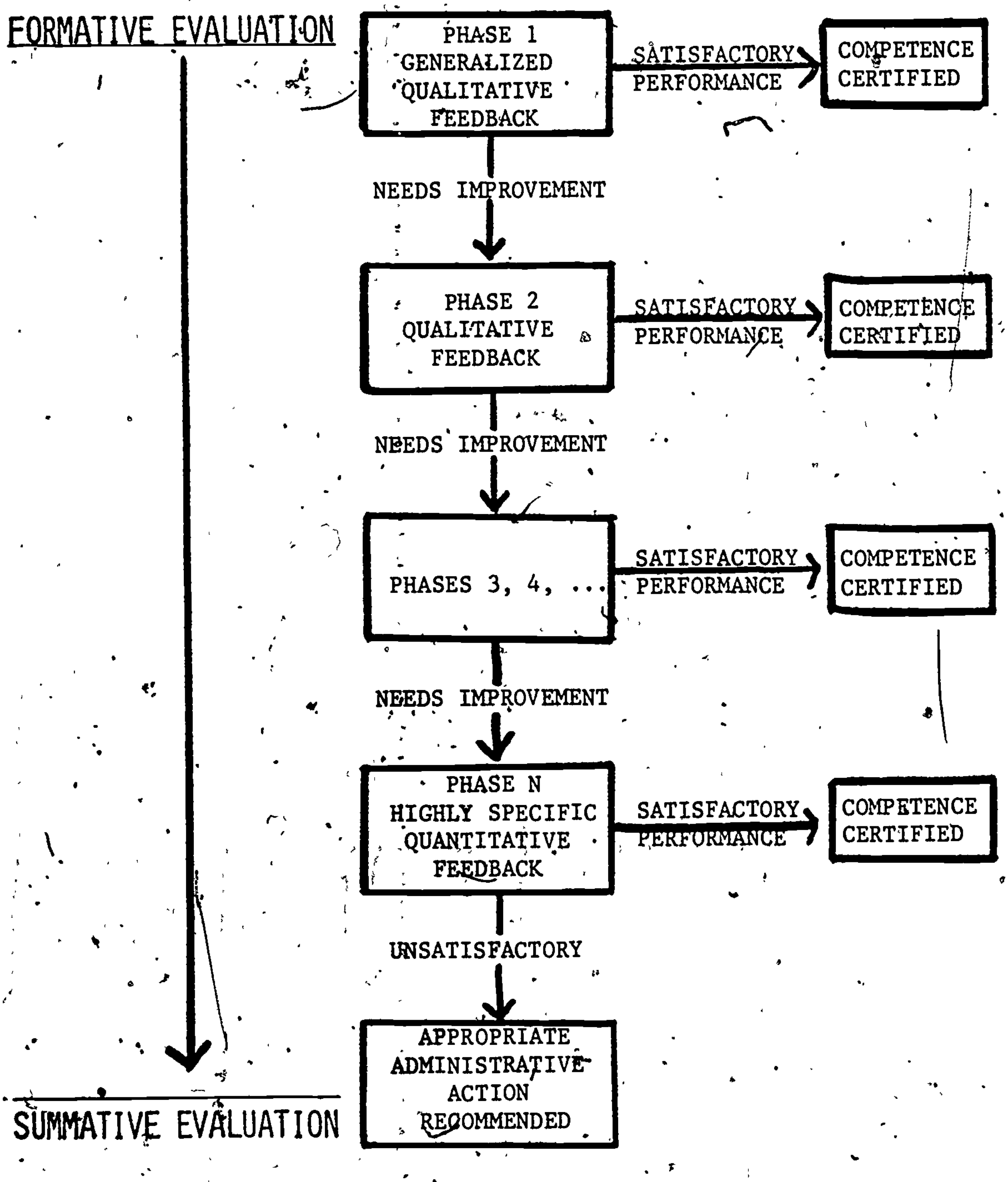
Dr. James Shymanski, Professor, Science Education Center, The University of Iowa, Iowa City, Iowa 52242

There is nothing new about the idea of teacher evaluation. Parents, school boards, administrators, teachers, and teacher educators have long been interested in monitoring and measuring teacher effectiveness. Evaluating teacher performance, however, is a difficult and delicate process requiring sensitive techniques. In this session a teacher evaluation model was presented which focused on ways to collect and analyze teacher performance data. Examples of criteria and assessment items applicable to science classrooms were presented as well as suggestions on how to use collected data for the improvement of teaching performance.

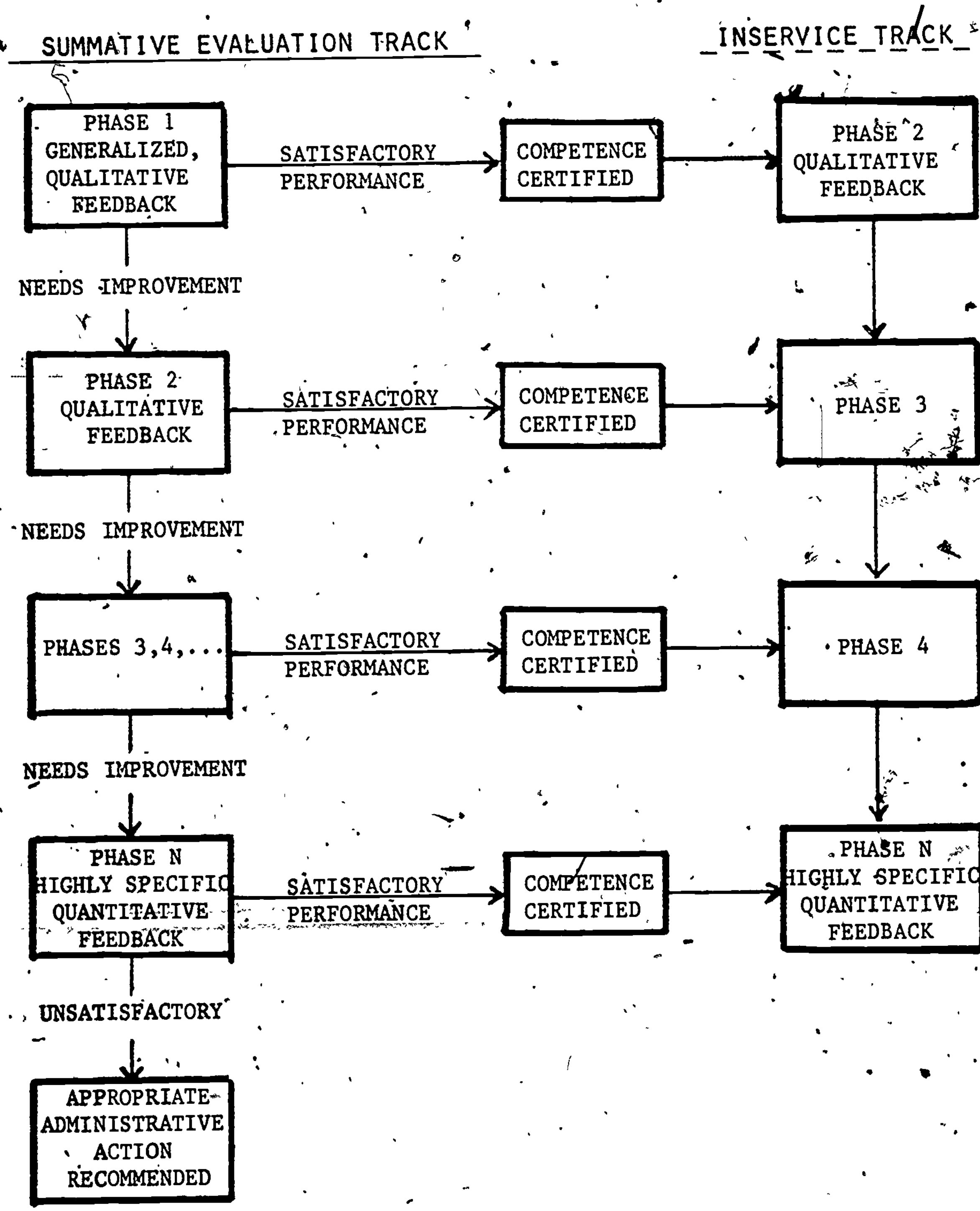
The teacher evaluation model is based on a progressive scheme which combines formative and summative evaluation techniques in one broad implementation plan. The feedback phase of the evaluation model incorporates standardization techniques for interpreting data on teacher performance. Both the progressive evaluation plan and the standardization techniques were discussed.

NEW APPROACHES TO SUPERVISION (cont.)

PROGRESSIVE EVALUATION MODEL
IMPLEMENTATION PLAN



PROGRESSIVE EVALUATION MODEL WITH DEVELOPMENTAL TRACK



OBJECTIVE DATA GATHERING IN THE CLASSROOM

Donald B. Peck, Science Supervisor, Woodbridge Township School District, P.O. Box 428, Woodbridge, NJ 07095

Objective data gathering in the classroom is a systematic part of observing the teaching/learning process with the intent of improving the instructional process. It is logically the classroom portion of clinical supervision.

The basic approach is to focus on only one aspect of the teaching process at one time. The teacher and the supervisor should agree, prior to the observation, upon the aspect that is to be observed. The problem should be carefully defined, agreement should be reached as to the kind of data which will elucidate the problem, and the manner of collecting the data should be agreed upon.

Data is usually collected for a minimum of three weeks (once each week). After each observation, the teacher and supervisor sit together to inspect and analyze the data.

If after three weeks the desired changes have occurred, the process is suspended. However, if more progress is desired, it can be continued as long as is fruitful. Usually, a follow-up observation is held three months later to show that the behavior has been maintained.

Clinical supervision as a process should be approached slowly. Start with only one or two teachers. They should be at least moderately good and should feel secure in the supervisor's presence. To start with poor teachers is very difficult and may cause failure as the supervisor is learning the techniques.

This technique is usually successful. Change almost invariably results. Teachers become less threatened by the process because they have a part in designing it; the focus is on the data instead of the teacher.

OBJECTIVE DATA GATHERING IN THE CLASSROOM (cont.)

Introduction: Objective Data Gathering and Analysis (often called Clinical Methods or Clinical Supervision) is simply a systematic way of focusing on a specific instructional technique or problem that one wishes to improve, deciding what observable data would indicate change, and then the collection and analysis of the data as change is attempted.

Steps In The Process:

1. Decide upon the change that is desired--i.e., set an objective.

   Example: To reduce the number of questions which call for simple recall of facts and increase the number which call for application of knowledge, the analysis of problems, or the solution of a problem.

2. Decide what kind of data will indicate progress.

   Example: A list of the levels of questions asked in a class period and the numbers of each.

3. Decide how to collect data.

   Example: 1. List verbatim each of the questions asked (requires an observer).

   2. Record on tape the class and thus the questions (does not require an observer).

   3. Tally the numbers of each level of question asked (from the list or tape, or with an observer as initial data.

OBJECTIVE DATA GATHERING IN THE CLASSROOM (cont.)

4. Design an instrument to collect the data.

   Example: A pad of lined paper and a tally sheet.

5. Collect the data.

   This should be done at least three times, perhaps at weekly intervals. Analysis of the data should follow each collection.

6. Analyze the data.

   Example: Using Bloom's Taxonomy, what was the level or type of each question? How many of each were asked?

7. Check on persistence of observed improvements by collecting data again at longer intervals, perhaps 30 days, 60 days, 1 year.

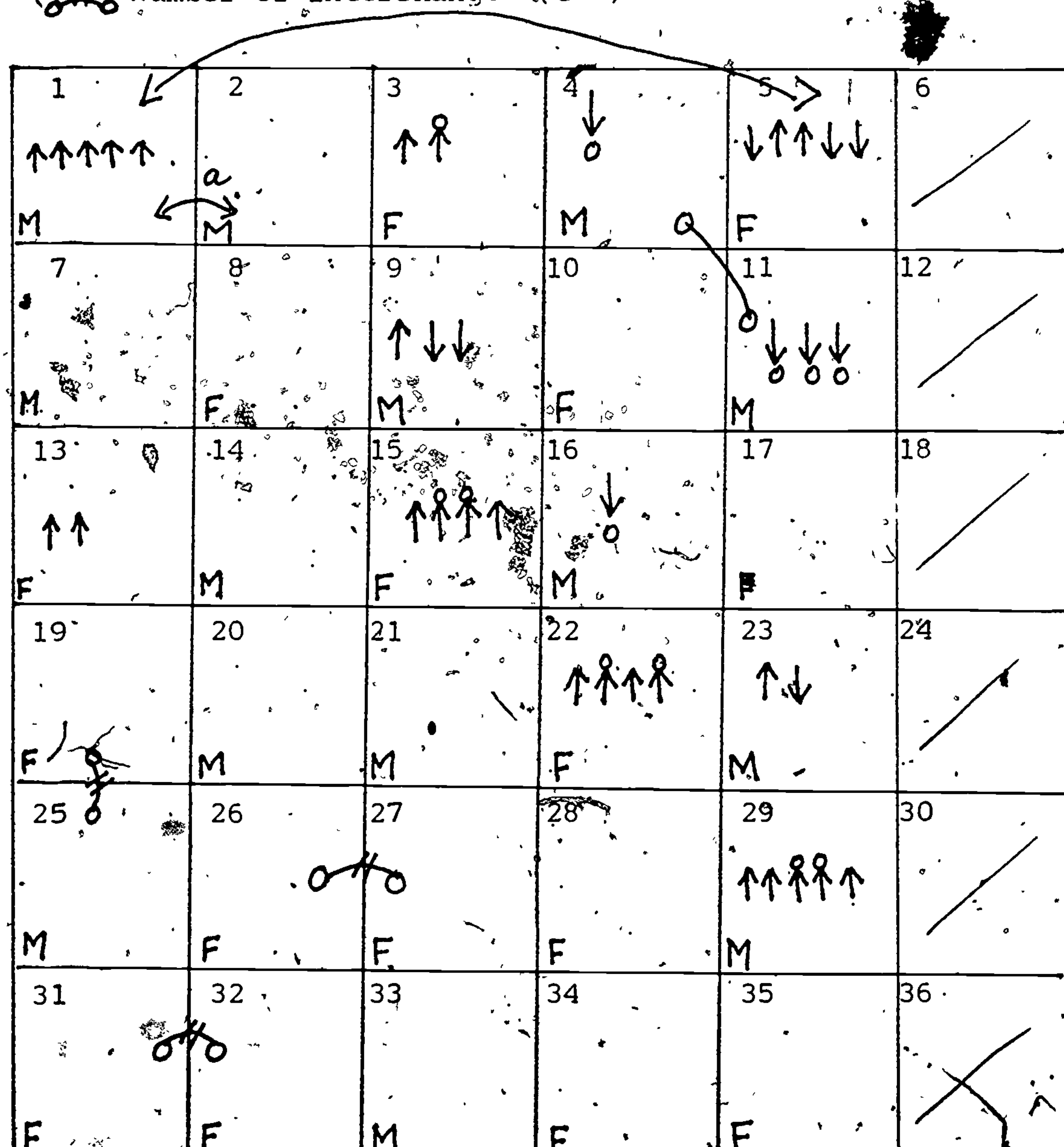
OBJECTIVE DATA GATHERING IN THE CLASSROOM (cont.)

Verbal Flow Analysis

Name_______________________________School______________________

Class__________Date_________Time____to____Observer__________________

↑ Student response: volunteered; relevant or correct
Student response: volunteered; irrelevant or incorrect
↓ Student response to teacher question: appropriate
Student response to teacher question: inappropriate
↔ Student to student interchange: relevant
Student to student interchange: irrelevant
Number of interchanges (two)



strong diagonal (NE)
ignores SW

tends to call on M
a = acknowledged by teacher

OBJECTIVE DATA GATHERING IN THE CLASSROOM

On Task Analysis

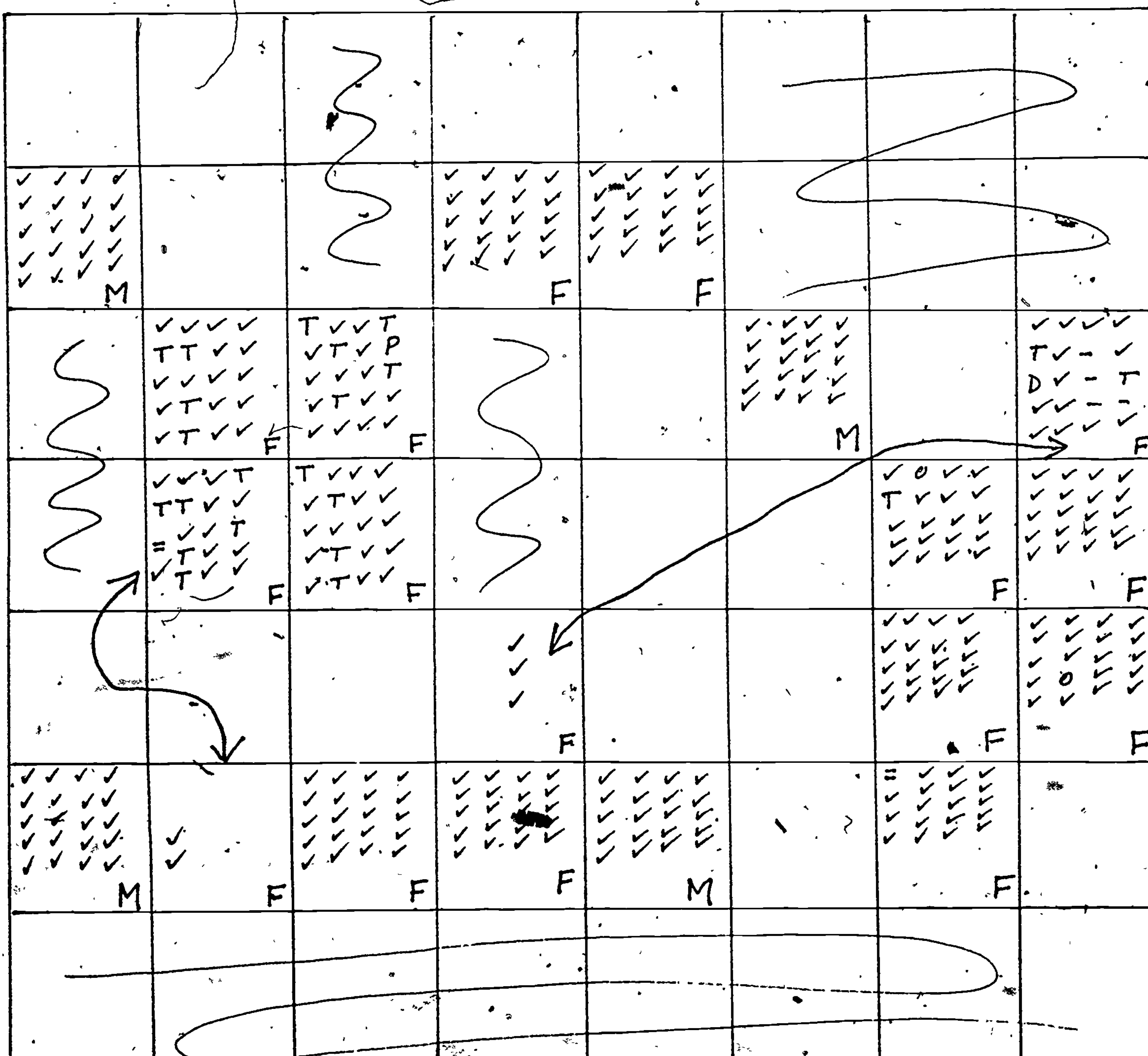
Teacher: ____________

School: ____________

Date: 10/25/75 #Students 18

Interval			
1 10^{44}	7 11^{00}	13 11^{11}	19 11^{21}
2 10^{47}	8 11^{02}	14 11^{13}	20 11^{22}
3 10^{49}	9 11^{04}	15 11^{15}	
4 10^{52}	10 11^{06}	16 11^{17}	
5 10^{55}	11 11^{07}	17 11^{18}	
6 10^{58}	12 11^{10}	18 11^{20}	

KEY:
- ✓ On task
- T Talking
- H Homework
- W Wandering
- D Daydreaming
- O Other



FEDERAL GRANTS IN (PRE-COLLEGE) SCIENCE EDUCATION

Charles Wallace, Director IDSE, Science Education Division, National Science Foundation, Washington, D.C. 20550

There is little change in the status of funding from all Federal agencies during the past three or four years. The National Science Foundation generally has less dollars than it has had in earlier years, but there are funds available from other Federal granting agencies other than NSF. Generally funding for pre-college science can be categorized in four areas: Development of Curriculum, Teacher Training, Information Dissemination for Science Education, and Curriculum Implementation. Dr. Wallace is the director of the Program in NSF for Science Information Disemination; he spoke in some detail about the funding for his program.

Most science curriculum development is underway in agencies other than NSF. The NSTA Energy Education curriculum is being funded by the Department of Energy. The Seagrant program is developing the NOAH curriculum under Barbara Spector's management. Other agencies are developing science curricula for handicapped learners in special categories. The Department of Education continues to support metric education for teachers. The Teacher Center Program and the Teacher Corps are providing staff development for teachers through the Department of Education. NSF funding for teacher in service training was reinstituted in 1977 at a very modest level after a lull of several years when Congress would not allow NSF to fund any kind of teacher education programs.

The Information Dissemination for Science Education Program is a modest effort and quite young as NSF programs go. It began in 1977 with $700,000 granted, but in the FY 1980, there will be about $1.3 million available for projects such as this NSSA-NSF/IDSE conference. Dr. Wallace encouraged NSSA membership to resubmit for future funding and continued operation of science leadership programs.

Science implementation is occurring through the National Diffusion Network. NSF-developed ISIS program is in this network and some dollars are available in each state through the state curriculum facilitator system to implement this program in high schools.

There are "straws of change" in the wind. Several events are moving along concurrently which may affect all science education funding in the near future.

1. In-service Training for Elementary Teachers will transfer October 1, 1980 from NSF to DE.
2. Jim Rutherford, with his middle school priorities, has left NSF and gone to DE.
3. Crisis in Supervision was asserted by the Illinois study in 1977; a recent study in California reported

that less than 2% of all school districts in that state have science supervisors.

4. The Synthesis Studies, commissioned by the NSF, have just been submitted. They examine the current status of science education in the nation.
5. The President's request for a status statement on the condition of science education in the nation's schools was not ready for the July 1, 1980 deadline, but now is to be on the President's desk by August 17th.
6. The National Academy of Science has done a parallel study which is to be made public on October 15, 1980.
7. The National Science Board will have a report on the matter published by the end of this year.
8. The Government Accounting Office is conducting a study of science education which will be used internally in the government and not have public distribution.

SCIENCE EDUCATION: WHERE ARE WE HEADED?

Dr. David P. Butts, Professor, Science Education, The University of Georgia, Athens, Georgia 30602

School is a function of what society wants it to do. It provides:

1. Knowledge to make wise choices and decisions.
2. A collection of socialization skills.
3. A place for custodial holding.
4. An academic sorting ground.

An educational scenario for the year 2000 might appear to be something like this:

1. A full year of school-15 week cycles.
2. Smaller classes-emphasize socialization and learning.
3. Teachers-want more money.
4. Parents-want schools to emphasize more custodial care.
5. Politicians-want to lower taxes.
6. Science labs-maybe needed to provide enthusiasm.

Presently, the instructional context of schooling is effected by academic and attitudinal outcomes.

1. The characteristics of teachers really do not have an effect on student outcomes.
2. Teacher's behavior does not make the difference in student outcomes.
3. The effectiveness of teaching behavior occurs when a person has the characteristics and knows when to use the skills.

The link between effective teaching behavior and student outcomes is the time a student is actually involved in the task in class. How do you accomplish this? Some of the following strategies can be used to enhance student outcomes:

1. Focus on where the help is needed.
   a. Design a diagnostic task for each learning objective. This can be in the form of four questions.
   b. Include these four questions in the unit test.
   c. Compare the class' achievement with last year's results-whole class, whole district.
   d. Establish minimum competency-ex. 80% of the students will achieve 80% of the objectives.

Format

Objective	District %	School %	Ind. Teacher's Class %
Four questions	Avg.performance	Avg.performance	Avg. performance

2. Clarify the task, both for the teacher and the class. The structure effects outcomes. Lower I.Q. ranged (below 95) students need more structure. Above range students need less structure.
3. The physical setup of the room effects outcomes.
4. On task behavior is decreased by lack of student and teacher interest.
5. Class rapport is very important. How well do the students like the teacher, and how well does the teacher like the students?

6. Provide for response opportunities. Let the students know that they are needed in that class. Let them say something and do something with what they say. Questioning techniques are important.

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